Applied Geochemistry

JOURNAL OF THE INTERNATIONAL ASSOCIATION OF GEOCHEMISTRY AND COSMOCHEMISTRY

VOL. 9, 1994

PERGAMON

APPLIED GEOCHEMISTRY

EXECUTIVE EDITOR

Ron Fuge, *Institute of Earth Studies, University of Wales, Aberystwyth, Dyfed SY23 3DB, U.K.*

ASSOCIATE EDITORS

A. Appelo, *Faculty of Earth Sciences, Vrije Universiteit Amsterdam, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands*
H. Armannsson, *Orkustofnun, Grensasvegur 9, 18-108 Reykjavik, Iceland*
M. F. Billett, *Department of Plant and Soil Science, University of Aberdeen, Meston Building, Aberdeen, AB9 2UE, U.K.*
J. G. Catts, *Harding Lawson Associates, 7655 Redwood Blvd, (PO Box 578), Novato, CA 94947, U.S.A.*
L. de Pablo, *Instituto de Geologia, Universidad Nacional Autonoma de Mexico, Apartado Postal 70-296, 04510 Mexico DF, Mexico*
W. M. Edmunds, *British Geological Survey, Maclean Building, Crowmarsh Gifford, Wallingford, Oxfordshire OX10 8BB, U.K.*
P. Fritz, *UFZ-Umweltforschungszentrum Leipzig-Halle, Permoserstrasse 15, D-7050 Leipzig, Germany*
M. Gascoyne, *Applied Geoscience Branch, Atomic Energy of Canada Ltd, Pinawa, Manitoba R0E 1L0, Canada*
W. D. Gunter, *Oil Sands and Hydrocarbon Recovery, Alberta Research Council, PO Box 8330, Station F, Edmonton, Alberta T6H 5X2 Canada*
K. S. Heier, *Geological Survey of Norway, PO Box 3006, N-7001 Trondheim, Norway*
J. S. Herman, *Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22903, U.S.A.*
L. K. Kauranne, *Geological Survey of Finland, SF-02150 Espoo, Finland*
Y. K. Kharaka, *U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025, U.S.A.*
V. K. Lukashev, *Institute of Geochemistry and Geophysics, Academy of Sciences of the BSSR, Zhodinskaya 7, 220023 Minsk, Byelorussia*
J. C. Petit, *CEA, Département Stockage Déchets, 60–68 Avenue du général Leclerc, BP6-92265 Fontenay-aux-Roses Cedex, France*
D. D. Runnells, *Shepherd Miller Inc., 1600 Specht Point Drive, Suite F, Fort Collins, CO 80525, U.S.A.*
O. Selinus, *Geological Survey of Sweden, PO Box 670, S-75128, Uppsala, Sweden*
B. R. T. Simoneit, *College of Oceanography, Oregon State University, Corvallis, OR 97331, U.S.A.*
R. E. Smith, *CSIRO Division of Exploration and Mining, Private Mail Bag, PO Wembley, WA 6014, Australia*
Y. Tardy, *Université Louis Pasteur, Strasbourg Institut de Géologie, 1 Rue Blessig, 67084 Strasbourg Cedex, France*
H. Wakita, *Laboratory of Earthquake Chemistry, University of Tokyo, Bunkyo-ku, Tokyo, Japan*
Y. Zeng, *Department of Geology, Peking University, Beijing, People's Republic of China*
R. A. Zielinski, *U.S. Geological Survey, MS 424, Denver Federal Center, Denver, CO 80225, U.S.A.*

PUBLICATIONS COMMITTEE

A. A. Levinson (*Chairman*), R. Fuge, V. K. Lukashev, J. R. O'Neil

---

Production Editor: Val Lepper, Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, U.K. (Tel.: (01865) 843531; Fax: (01865) 843948)

INTERNATIONAL ASSOCIATION OF GEOCHEMISTRY AND COSMOCHEMISTRY

President: H. Sakai | *Vice-President:* G. Faure | *Treasurer:* E. E. Angino
Past-President: H. Wanke | *Secretary:* M. Gascoyne

COUNCILLORS

S. V. Grigorian, R. S. Harmon, P. Jakes, M. McCulloch, E. R. Neumann, J. R. O'Neil, M. Ozima, H. Palme, T. M. Seward

Membership enquiries to Dr Mel Gascoyne, AECL Research, Pinawa, Manitoba R0E 1L0, Canada (see membership form at the back of the journal)

Published 6 issues/annum in January, March, May, July, September and November.

Publishing, Subscription and Advertising Offices: Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, U.K. (Tel.: (01865) 843000; Fax: (01865) 843010); Elsevier Science Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A. (Tel.: (914) 592 7700).

Annual Institutional Subscription Rates 1994: North, Central and South America, U.S. $329, Rest of World £221. Sterling prices exclud VAT. Non-VAT registered customers in the European Community will be charged the appropriate VAT in addition to the price listed Prices include postage and insurance and are subject to change without notice.

Special rates are available to members of IAGC. See membership application form at the back of this issue for further information o membership subscriptions.

Second Class Postage paid at Rahway, NJ. Postmaster send address corrections to *Applied Geochemistry*, c/o Elsevier Science Inc., 66 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.

Back Issues: Back issues of all previously published volumes, in both hard copy and on microform, are available direct from Elsevie Science offices (Oxford, New York).

Subscription enquiries from customers in North America should be sent to: Elsevier Science Inc., 660 White Plains Road, Tarrytown NY 10591-5153, U.S.A., and for the remainder of the world to: Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxfor OX5 1GB, U.K. (Tel.: (01865) 843000; Fax: (01865) 843911).

Copyright © 1994 Elsevier Science Ltd

ASSOCIATE EDITORS DURING 1994

A. Appelo, Amsterdam
H. Armannsson, Reykjavik
M. F. Billett, Aberdeen
J. G. Catts, Novato
L. de Pablo, Mexico DF
W. M. Edmunds, Oxfordshire
P. Fritz, Leipzig
M. Gascoyne, Manitoba
W. D. Gunter, Alberta
K. S. Heier, Trondheim
J. S. Herman, Charlottesville
L. K. Kauranne, Espoo
Y. K. Kharaka, Menlo Park
V. K. Lukashev, Minsk
J. C. Petit, Fontenay-aux-Roses
D. D. Runnells, Fort Collins
O. Selinus, Uppsala
B. R. T. Simoneit, Corvallis
R. E. Smith, Wembley
Y. Tardy, Strasbourg
H. Wakita, Tokyo
Y. Zeng, Beijing
R. A. Zielinski, Denver

REVIEWERS

Abercrombie H.
Aboul-Kassin T.A.
Abrahams P.
Adams W.
Åkerblom G.
Appelo C.A.J.
Arnorsson S.
Ball K.
Barkett A.
Bartlett K.B.
Barwick A.J.G.
Berner R.A.
Billett M.F.
Bischoff J.
Bolviken B.
Bourcier W.
Bourg A.
Bowell R.J.
Burnham A.
Busenberg E.
Carothers W.
Catts J.G.
Chou J.J.
Clark I.
Cramer J.J.
Davies B.E.
Davis A.
Davis A.O.
Davison W.
Dise K.B.
Dixon R.K.
Dromgoole E.
Durrance E.
Dove P.
Doyle G.
Edmunds W.M.
Evans B.
Ewing R.C.
Eyal Y.
Farmer J.
Frape F.D.
Fritz P.
Fuller C.C.
Gale N.H.
Gascoyne M.
Giggenbach W.
Gislason G.
Grauch D.
Griffault L.
Gunter W.D.
Hall P.L.
Hanor J.S.
Heath M.
Hegner E.
Hem J.D.
Henderickson F.
Herman J.S.
Hildreth W.
Hinton R.W.
Hitchon B.
Hoefs J.
Hul A.Y.
Hutcheon I.
Igarashi G.
Jacques C.
Johnson J.
Johnson L.H.
Kent D.
Kharaka Y.K.
Kinniburgh D.G.
Kronfeld J.
Levinson A.A.
Luth B.
Macklin M.G.
Manning D.A.C.
Mather J.D.
Mazor E.
McDonald A.M.
Miller W.
Milne C.J.
Muir I.
Naftz D.L.
Nash P.
Neal C.
Nesbitt W.
Nicholls J.
Nordstrom K.
Notsu K.
Olsen H.W.
Osgood D.
Oudley J.
Parrish R.R.
Patterson C.C.
Pearce N.J.G.
Pearson J.
Pekdeger A.
Petit J.-C.
Perkins E.
Perkins W.T.
Phillips F.
Postma D.
Presser T.S.
Raiswell R.
Reardon E.
Reddy K.C.
Reddy M.M.
Rochelle C.
Rosen K.
Rosenbaur R.
Rudkiewicz J.L.
Rugless C.
Runnells D.D.
Sano Y.
Sarna-Wojcicki A.
Sato M.
Schuiling R.D.
Simoneit B.R.T.
Smedley P.
Smith D.B.
Tardy Y.
Thomas J.M.
Thorpe J.
Thyne G.
Tribble G.
Vance E.R.
Vuataz F.D.
Walter A.V.
Warren C.J.
Weise S.
White A.
Williams C.T.
Wood W.
Wyatt A.R.
Zhou J.

CONTENTS OF VOLUME 9

NUMBER 1

Articles

J. L. PROBST, J. MORTATTI and Y. TARDY: Carbon river fluxes and weathering CO_2 consumption in the Congo and Amazon river basins 1

R. J. BOWELL, N. H. MORLEY and V. K. DIN: Arsenic speciation in soil porewaters from the Ashanti Mine, Ghana 15

Y. DENG and W. STUMM: Reactivity of aquatic iron(III) oxyhydroxides—implications for redox cycling of iron in natural waters 23

L. WANG, K. J. REDDY and L. C. MUNN: Geochemical modeling for predicting potential solid phases controlling the dissolved molybdenum in coal overburden, Powder River Basin, WY, U.S.A. 37

D. EVANS and B. E. DAVIES: The influence of channel morphology on the chemical partitioning of Pb and Zn in contaminated river sediments 45

M. E. HINKLE: Environmental conditions affecting concentrations of He, CO_2, O_2 and N_2 in soil gases 53

A. FRANKENBERGER, R. R. BROOKS, H. VARELA-ALVAREZ, J. D. COLLEN, R. H. FILBY and S. L. FITZGERALD: Classification of some New Zealand crude oils and condensates by means of their trace element contents 65

M. E. EXNER and R. F. SPALDING: N-15 Identification of nonpoint sources of nitrate contamination beneath cropland in the Nebraska Panhandle: two case studies 73

C.-Y. KING, D. BASLER, T. S. PRESSER, W. C. EVANS, L. D. WHITE and A. MINISSALE: In search of earthquake-related hydrologic and chemical changes along Hayward Fault 83

SONG CAO and I. LERCHE: Thermal history reconstruction by inversion of down-hole S2 pyrolysis data: synthetic studies and case histories 93

IAGC application form I

NUMBER 2

Articles

D. C. BAIN, D. M. L. DUTHIE and J. D. MILLER: Inorganic nutrient inputs from mineral weathering in two Scottish upland ecosystems 119

D. BARTON, D. HOPE, M. F. BILLETT and M. S. CRESSER: Sulphate adsorption capacity and pH of upland podzolic soils in Scotland: Effects of parent material, texture and precipitation chemistry 127

Y. TOHJIMA and H. WAKITA: Development of a continuous measurement system and areal distribution of methane in some source areas 141

V. DUCHI, M. E. CAMPANA, A. MINISSALE and M. THOMPSON: Geochemistry of thermal fluids on the volcanic isle of Pantelleria, southern Italy 147

S. BIERENS DE HAAN, J. E. RAE and A. PARKER: Pyrite oxidation in the Tertiary sands of the London Basin aquifer 161

D. G. KINNIBURGH, I. N. GALE, P. L. SMEDLEY, W. G. DARLING, J. M. WEST, R. T. KIMBLIN, A. PARKER, J. E. RAE, P. J. ALDOUS and M. J. O'SHEA: The effects of historic abstraction of groundwater from the London Basin aquifers on groundwater quality 175

W. R. TAYLOR, N. M. S. ROCK, D. I. GROVES, C. S. PERRING and S. D. GOLDING: Geochemistry of Archean shoshonitic lamprophyres from the Yilgarn Block, Western Australia: Au abundance and association with gold mineralization 197

M. M. REDDY and H. C. CLAASSEN: Specific surface area of a crushed welded tuff before and after aqueous dissolution 223

J. E. CALLAHAN, J. W. MILLER and J. R. CRAIG: Mercury pollution as a result of gold extraction in North Carolina, U.S.A. 235

Announcements 243

IAGC application form I

NUMBER 3

Articles

L. A. WARREN and A. P. ZIMMERMAN: The importance of surface area in metal sorption by oxides and organic matter in a heterogeneous natural sediment 245

S. GIN, N. GODON, J. P. MESTRE, E. Y. VERNAZ and D. BEAUFORT: Experimental investigation of aqueous corrosion of R7T7 nuclear glass at 90°C in the presence of organic species 255

D. D. SNOW and R. F. SPALDING: Uranium isotopes in the Platte River drainage basin of the North American High Plains Region 271

R. J. BOWELL: Sorption of arsenic by iron oxides and oxyhydroxides in soils 279

G. CHIODINI: Temperature, pressure and redox conditions governing the composition of the cold CO_2 gases discharged in north Latium (Central Italy) 287

J. M. MATRAY, M. LAMBERT and J. CH. FONTES: Stable isotope conservation and origin of saline waters from the Middle Jurassic aquifer of the Paris Basin, France 297

K. A. RODGERS: The cycle of phosphorus in an atoll ecosystem 311

J. A. WESTGATE, W. T. PERKINS, R. FUGE, N. J. G. PEARCE and A. G. WINTLE: Trace-element analysis of volcanic glass shards by laser ablation inductively coupled plasma mass spectrometry: application to tephrochronological studies 323

T. A. DOYLE, A. DAVIS and D. D. RUNNELLS: Predicting the environmental stability of treated copper smelter flue dust 337

Book Reviews

R. J. BOWELL: Natural Zeolites 351

J. S. TRIBBLE: Geochemistry of Clay-Pore Fluid Interactions 352

IAGC application form I

NUMBER 4

Articles

K. G. STOLLENWERK: Geochemical interactions between constituents in acidic groundwater and alluvium in an aquifer near Globe, Arizona 353

Y. SANO, J. HIRABAYASHI, T. OBA and T. GAMO: Carbon and helium isotopic ratios at Kusatsu-Shirane Volcano, Japan 371

L. E. BÅGANDER and R. CARMAN: *In situ* determination of the apparent solubility product of amorphous iron sulphide 379

R. L. MICHEL and R. A. SCHROEDER: Use of long-term tritium records from the Colorado River to determine timescales for hydrologic processes associated with irrigation in the Imperial Valley, California 387

E. E. VAN DER HOEK, P. A. BONOUVRIE and R. N. J. COMANS: Sorption of As and Se on mineral components of fly ash: relevance for leaching processes 403

T. D. PRICE, G. GRUPE and P. SCHRÖTER: Reconstruction of migration patterns in the Bell Beaker period by stable strontium isotope analysis 413

I. VARSÁNYI and L. Ó. KOVÁCS: Combination of statistical methods with modelling mineral–water interaction: a study of groundwater in the Great Hungarian Plain 419

K. J. WENRICH and R. M. AUMENTE-MODRESKI: Geochemical soil sampling for deeply-buried mineralized breccia pipes, northwestern Arizona 431

K. SCHRIJVER, R. E. ZARTMAN and A. E. WILLIAMS-JONES: Lead and barium sources in Cambrian siliciclastics and sediment provenance of a sector of the Taconic Orogen, Quebec: a mixing scenario based on Pb-isotopic evidence 455

Book Reviews

J. S. COATS: Regolith Exploration Geochemistry in Arctic and Temperate Terrains 477

K. NICHOLSON: Electrochemical Methods in Soil and Water Research 478

R. FUGE: Regional Geochemistry: Lake District and Adjacent Areas 478

IAGC application form I

NUMBER 5

Articles

H. YOSHIDA: Relation between U-series nuclide migration and microstructural properties of sedimentary rocks 479

M. M. REDDY, H. C. CLAASSEN, D. W. RUTHERFORD and C. T. CHIOU: Welded tuff porosity characterization using mercury intrusion, nitrogen and ethylene glycol monoethyl ether sorption and epifluorescence microscopy 491

W.-L. HUANG and J. M. LONGO: Experimental studies of silicate–carbonate reactions—I. Applications to diagenesis 501

W.-L. HUANG and J. M. LONGO: Experimental studies of silicate–carbonate reactions—II. Applications to steam flooding of oil sands 523

T. M. WHITWORTH and S. J. FRITZ: Electrolyte-induced solute permeability effects in compacted smectite membranes 533

Y. KANAI and Y. SAKAMAKI: Uranium redistribution implied by $^{234}U/^{238}U$ disequilibrium study on apatite-bearing sedimentary rocks at Nakamaruke district, central Japan 547

S. D. VORONKEVICH: Engineering geochemistry: problems and applications 553

S. HE, J. E. ODDO and M. B. TOMSON: The inhibition of gypsum and barite nucleation in NaCl brines at temperatures from 25 to 90°C 561

A. DAVIS, J. H. KEMPTON, A. NICHOLSON and B. YARE: Groundwater transport of arsenic and chromium at a historical tannery, Woburn, Massachusetts, U.S.A. 569

B. STRÖMBERG and S. BANWART: Kinetic modelling of geochemical processes at the Aitik mining waste rock site in northern Sweden 583

M. A. WILLIAMSON and R. A. PARNELL, JR: Partitioning of copper and zinc in the sediments and porewaters of a high-elevation alkaline lake, east-central Arizona, U.S.A. 597

IAGC application form I

NUMBER 6

Articles

M. MUNOZ, A. J. BOYCE, P. COURJAULT-RADE, A. E. FALLICK and F. TOLLON: Multi-stage fluid incursion in the Palaeozoic basement-hosted Saint-Salvy ore deposit (NW Montagne Noire, southern France) 609

A. M. GHAZI: Lead in archaeological samples: an isotopic study by ICP-MS 627

B. HITCHON and M. BRULOTTE: Culling criteria for "standard" formation water analyses 637

I. TELL, I. BENSRYD, L. RYLANDER, G. JÖNSSON and E. DANIEL: Geochemistry and ground permeability as determinants of indoor radon concentrations in southernmost Sweden 647

L. AQUILINA, J. BOULEGUE, J.-F. SUREAU, T. BARIAC and THE GPF TEAM: Evolution of interstitial waters along the passive margin of the Southeast Basin of France: WELCOM (Well Chemical On-line Monitoring) applied to Balazuc-1 well (Ardèche) 657

G. MERRINGTON and B. J. ALLOWAY: The transfer and fate of Cd, Cu, Pb and Zn from two historic metalliferous mine sites in the U.K. 677

M. G. MACKLIN, J. RIDGWAY, D. G. PASSMORE and B. T. RUMSBY: The use of overbank sediment for geochemical mapping and contamination assessment: results from selected English and Welsh floodplains 689

B. BOULANGÉ and F. COLIN: Rare earth element mobility during conversion of nepheline syenite into lateritic bauxite at Passa Quatro, Minais Gerais, Brazil 701

E. C. PEARCY, J. D. PRIKRYL, W. M. MURPHY and B. W. LESLIE: Alteration of uraninite from the Nopal I deposit, Peña Blanca District, Chihuahua, Mexico, compared to degradation of spent nuclear fuel in the proposed U.S. high-level nuclear waste repository at Yucca Mountain, Nevada 713

Book Review

D. J. VAUGHAN: Applied Mössbauer Spectroscopy. Theory and Practice for Geochemists and Archaeologists 733

IAGC application form I

Indexes to Volume 9 i